Geospatial-Intelligence Standards: The Basics

Part 1: Standards Fundamentals

On-line training modules sponsored by the Geospatial Intelligence Standards Working Group (GWG)

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Overview

Part 1 gives you the basics about standards and why they are important to our daily lives. Standards are something that most people do not think about, but they provide us with many conveniences and keep our daily life humming along. They allow you to buy either a GE or Sylvania light bulb to use in either your desk lamp or living room stand-up lamp, they ensure that your house has basic safety features built into it, they protect your food and water from contamination, and they ensure that you can communicate with others using the latest technology.

In this module you will learn:

- What are standards
- What are the different types of standards
- What do standards do for us
- What are the benefits of standards
- Who creates standards
- The language of standards
- Quick Quiz

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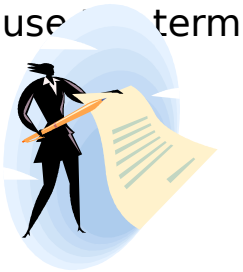
What are Standards?

A standard is defined, by the International Organization of Standardization (ISO) and the International Electrotechnical Commission (IEC) (ISO/IEC Guide2: Standardization and Related Activities – General Vocabulary, date), as “a document, established by consensus, and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context”.

The American National Standards Institute (ANSI) defines a standard as “…a document that defines the characteristics of a product, process or service, such as dimensions, safety aspects, and performance requirements.”

Standardization is defined by ANSI as the use of common products, processes, procedures, and policies to facilitate attainment of business objectives.

Specifications are agreed-upon details that define products, materials, services, and processes. Standards are “specifications” that have been agreed upon by a standards body. The terms “standard” and “specification” are sometimes used interchangeably, but for the purposes of this lesson, we will use the term “standard.”



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What are the Different Types of Standards?

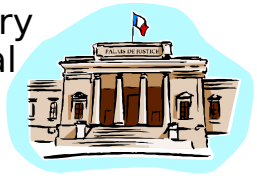
Consensus standards are developed through a consensus-based process where general agreement is arrived at by seeking and taking into account view of all interested parties affected by the standard.

Private sector standards created by consensus are considered **voluntary standards,** to be used at the discretion of industry, government, academia, etc.

Voluntary standards, may, however, become **mandatory standards** by being written into laws and regulations at the County, State or Federal level. Thus, an industry standard, defined by ANSI as a "voluntary, industry-developed document that establishes requirements for products, practices, or operations" may be made mandatory through contractual agreements or by being incorporated into government laws and regulations.

De facto* standards** are developed outside of traditional standards bodies and are accepted in the market place because of their widespread use. *De facto* standards may be formally accepted by a standards body and are then called ***de jure standards.

Standards created by the government, called **government-unique standards**, may be voluntary (to facilitate business) or prescribed by laws and regulations (for public health and safety). Government-unique standards are developed when private sector standards are not available or do not meet government requirements. They, along with industry voluntary standards, may be prescribed for use within the government through internal policies and directives.



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What are the Different Types of Standards? (cont.)

Standards can also be either proprietary or open.

Proprietary standards are generally copyrighted by an organization and not available for use by others except under strict contractual terms.

Open standards are standards that are not proprietary, meaning they are publicly available for anyone to use, although there may be licensing fees associated with them. Open standards promote interoperability by enabling multiple vendors to build products and services that are based on the same standards, enabling them to work together. Open standards are usually developed through an open consensus-based process, whereas proprietary standards are created by and for the use of individual businesses.

In addition to the distinctions in standards listed above, which underscore the development and acceptance aspects of a standard, there are other categorizations that are key to understanding standards and exactly what they do. These will be discussed in Part 3 on Geospatial Intelligence Standards.

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So, What Do These Standards Do For Us?

Standards protect your health, safety, and the environment in which you live. Standards ensure the interoperability and compatibility of the products and communications devices you use. In essence, standards make your life more convenient and safer.

For example, the following are all governed by standards: clothing sizes and materials; the amount of contamination in your drinking water; air, sea and ground transportation systems; and communications devices, such as the telephone, radio, and the internet.

Let's look at some other examples.

Consumer Goods

Product standards help consumers purchase goods that do what they say they are supposed to do and are not harmful. The U.S. Consumer Product Safety Commission (CPSC) is a government regulatory agency that has jurisdiction over 15,000 types of consumer products, from toys to household mechanical and electronic products. The CPSC works with a variety of standards organizations associated with these products and identifies voluntary consensus standards that are used in determining product safety. The CPSC and other government agencies with product oversight responsibilities may also mandate voluntary standards and ban non-conforming products. For example, standard safety requirements are defined for children's toys that define such characteristics as material for stuffed toys and the sharpness of edges and points. Standardized testing methods are used to determine product compliance.

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So, What Do These Standards Do For Us? (cont.)

Your Home

New buildings are governed by mandated building codes that ensure they are constructed to specific standards that enhance your safety and convenience. In hurricane prone areas, mandated building standards ensure a level of protection from damage during projected storms levels. Mandated standards for electrical wiring and plum ensure that your home has properly working elements and is safe from cer hazards. Testing and certification are means of determining adherence to mandatory standards. Voluntary industry standards also play an important They ensure that the various products and tools used in building your home interoperate and are compatible. For example, sizes and types of electrical wiring and outlet sockets from various industry manufacturers are standardized so that you can easily repair and replace them.

Food and Drugs

The Food and Drug Administration (FDA) regulates food, drugs, cosmetics, medical devices, and other electronic devices to ensure the safety of the consumer. In the area of medical devices, such as X-ray and Magnetic Resonance Imaging (MRI) machines, a number of or often in coordination with ANSI, develop standards that govern their use and performa within the U.S. and internationally. The FDA identifies and formally recognizes appropriate consensus standards and measures manufacturers conformance to them when conducting product testing and evaluations. Standards play an importa role in carrying out the FDA's responsibilities to the industries it regulates and the consumers it serves, from standards for research and review processes, to food and nutritional measurements, to cosmetic labeling, to standard nomenclatures to be used in research and regulatory documents.

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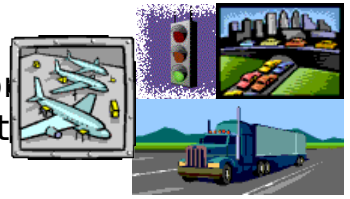
So, What Do These Standards Do For Us? (cont.)

Transportation

Transportation standards are used at the federal government level by organizations, such as the U.S. Department of Transportation (USDOT) and the Federal Aviation Administration (FAA). From roadway construction to vehicle, railroad, and airlines safety, voluntary and mandatory standards make our travels safer and easier. The USDOT is implementing standards that enable the building of enhanced electronic communications systems for intelligent transportation systems, with compon that work together to ensure the safety and efficiency of surface transportat



Environment

The Environmental Protection Agency (EPA) plays a role in developing and mandating standards that affect the quality of our air, ground, and water. Standards incorporated into regulations by the EPA set minimum and maximum contamination levels and prescribe processes for the reduction and clean-up of hazardous environmental elements. For example, the National Ambient Air Quality Standards sets limits on the emission of pollutants into the atmosphere. Voluntary standards produced at the national and international level play a large role in promoting sound environmental management practices. The EPA depends on voluntary standards develop in the private sector to carry out its responsibilities. For example, volunta standards set by the American Society for Testing and Materials are used by the EPA to measure the compliance of certain products to government regulations that require the products to be made of degradable materials.

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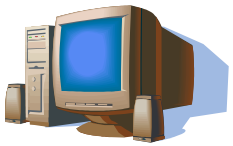
So, What Do These Standards Do For Us? (cont.)

Communications

In today's technically advanced world, ease of communications is essential in carrying out our daily lives. Not only new communications technology, but the standards governing communications technology make this possible. Standards ensure that a telegraph message can be interpreted anywhere it is received, that your telephone can "ring up" any one else's telephone anywhere in the world, and that common services are provided over the internet to all users. The growing interoperability of computer hardware and software that supports the information and financial needs of consumers and businesses alike is the result of adherence to agreed upon standards.

Consider the Universal Serial Bus (USB) standard that governs the connection of multiple peripheral computer devices. Prior to being USB compliant, devices, such as scanners, printers, and keyboards, were connected to your personal computer via unique ports and custom drivers. These incompatibilities made computer configuration for users, as well as for vendors, "messy" and difficult, to say the least. Standardizing computer ports and peripheral devices to the USB addressed a number of configuration problems and has benefited co[illegible]s tremendously.



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What Are Some Other Benefits of Standards?

You've seen how standards protect your health and your safety and provide conveniences in your daily life. Standards also benefit consumers and producers in other ways.

Standards benefit consumers by lowering costs for goods and services. As an example, perhaps you are buying new curtains for your home. Because you have a standard size window, you can buy curtains in a number of standard size widths and lengths, you have a large selection from a number of different manufacturers to choose from, and you can shop at a wide variety of stores that stock them. Standard size curtains are less expensive to purchase than "custom" made curtains because they can be mass produced and sold at competitive prices.

Producing "standard" rather than "custom" products benefits not only the consumer, but the manufacturers or business interests involved. Producing "standard" products can increase the sources from which to purchase materials, reduce technology risks inherent in using non-standard materials or approaches, reduce the costs associated with one-of-a-kind solutions, and increase their competitiveness and share of the market place.

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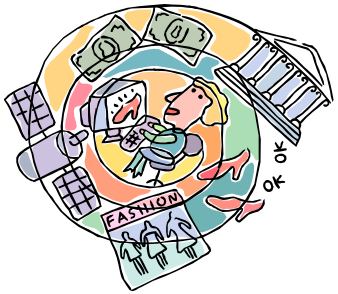
What Are Some Other Benefits of Standards? (cont)

Standardization of products and services can benefit the marketplace in the following ways:

- Increased efficiency
- Minimizing technical risks and development costs
- Promoting large-scale mass production
- Providing multiple supply sources
- Increasing interoperability and compatibility of products
- Assuring quality
- Encouraging competitive pricing



The more widely accepted the standards for products, services, and processes, the broader the marketplace. For example, international standardization enables a broader marketplace than national standardization, creating a larger customer base for businesses and greater accessibility and wider choices for customers.

So, standards not only make your life easier and safer, they may also provide financial benefits to consumers, manufacturers, and service providers, and they help to support local, national, and global economies.

And you may have thought standards didn’t really matter!

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Who Creates All of These Standards?

The U.S standards system involves a large number of players within the private sector and the U.S. federal government. The basics of the U.S. standards system are described below.

ANSI is a private sector standards body that acts as coordinator for the U.S. standards system. It does not develop standards, but rather accredits U.S. standards development organizations, formally approves standards as American National Standards (ANS), and represents U.S. interests in international standards activities. ANSI's mission is to enhance U.S. global competitiveness through the voluntary standardization system.

Standards development organizations (SDOs) are those organizations that develop standards. In the U.S., over 200 SDOs are accredited by ANSI and hundreds more non-accredited organizations are developing standards. SDOs represent a variety of industry sectors and include manufacturers, trade associations, scientific and professional societies, testing laboratories, cross-industry standards bodies, and government agencies. Most private sector SDOs develop voluntary, consensus-based standards.

SDOs accredited by ANSI follow approved consensus-based standards development processes that ensure open due process. Examples of accredited SDOs are the Air Conditioning and Refrigeration Institute, the American Society for Testing and Materials, the American Petroleum Institute, the Society of Motion Pictures Engineers, Underwriter's Laboratories, and the World Wide Web
Consortium (W3C). The Open Geospatial Consortium (OGC®) and ANSI accredi
InterNational Committee for Information and Technology Standards (INCITS) a rds
issues of particular interest to the federal government's geospatial communi
(More will be said about these organizations and their geospatial related stan
in Part 3).

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Who Creates All of These Standards? (cont.)

Industry consortia, which are groups made up of companies with a shared interest, may also develop and test standards outside of the recognized U.S. standards system. In other words, they may not be accredited by ANSI and may not follow the approval p of the more traditional SDOs, which can be long and cumbersome. Consortia may institute their own development processes that more rapidly provide standards needed to move products, such as those for new technologies, quickly into the market place.

Individual companies and businesses may develop proprietary standards that a ly to their own products and services. These standards may become *de facto* stand a product is very successful and has widespread use.

International organizations that are governmental and non-governmental also create standards that are important to the U.S. government and business interests. Governmental organizations that create standards include the North Atlantic Treaty Organization (NATO) and the Digital Geospatial Information Working Group (DGIWG), a multi-national body of defense organizations that supports geospatial standardization. The two main non-government standards development organizations are the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). ANSI is the representative to ISO and also represents the U.S., through the U.S. National Committee, at the I

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Who Creates All of These Standards? (cont.)

The **U.S. government** is a large creator and user of standards. Federal agencies actively participate in many private sector standards development organizations. Federal government representatives provide technical expertise and communicate federal agency requirements to help develop voluntary standards that are of interest to the government in meeting national needs.

In addition to participating in the development of voluntary consensus standards, many Federal agencies develop government-unique standards that support their agency missions. As an example, the U.S. Department of Defense develops and manages military specifications and standards under the Defense Standards Program (DSP). These are defined as follows:

Military Standard*:* A document that establishes uniform engineering or technical criteria, methods, processes, and practices.

Military Specification*:* A document prepared to support acquisition that describes essential technical requirements for materiel and the criteria for determining whether those requirements are met.

The processes and format/content of DoD standards are described in DoD 4120-24-M "Defense Standardization Program Policies and Procedures" and MIL-STD-962D, 1 August 2003, respectively.

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Why Does the Government Use Voluntary Standards?

The **National Technology Transfer and Advancement Act (NTTAA) of 1995 (Public Law 104-113),** directs federal agencies to adopt private sector standards, particularly those developed by
SDOs, wherever possible in lieu of creating proprietary, non-consensus standards.

The **Office of Management and Budget (OMB) Circular No. A–119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessments Activities,"** also mandates the use of voluntary consensus standards by the federal government whenever possible and provides guidelines on federal participation in SDOs.

These policies seek to achieve the following goals, as documented in OMB Circular A-119:

- Eliminate the cost to the Government of developing its own standards and decrease the cost of goods procured and the burden of complying with agency regulation.
- Provide incentives and opportunities to establish standards that serve national needs.
- Encourage long-term growth for U.S. enterprises and promote efficiency and economic competition through harmonization of standards.
- Further the policy of reliance upon the private sector to supply Government needs for goods and services.

Learn more about the NTTA at http://ts.nist.gov/Standards/Conformity/nttaa-qa.cfm
Read OMB Circular No. A–119.

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Summary

Here are some key points for you to take away from this lesson:

Much of our daily life is governed by standards, which are documents that define the characteristics of products, services, and processes. Standards protect our health, safety, and the environment in which we live. They provide us with convenience, enable us to communicate using new technologies, and increase the interoperability and compatibility of the products we use. They benefit consumers by lowering costs and assuring quality. Businesses also benefit from standards that minimize technology risks, increase supply sources, promote mass production, and open new market places.

In the U.S. standards system, standards are developed by standards development organizations (SDOs), industry consortia, individual companies, international organizations, and the government. The standards created may be voluntary, de facto, proprietary or open, or government-unique. Standards may become mandatory through laws and regulations.

The Federal government promotes the development and use of voluntary and open consensus-based standards to reduce government costs and duplications of effort, promote development of standards that meet national needs, promote economic competition for U.S. businesses, and increase government use of private sector goods and services. Federal representatives support many SDO standards development activities. In the absence of appropriate private sector standards, the Federal government develops standards specifically to meet mission requirements, such as the military standards and specifications of the Defense Department.

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The Language of Standards

In this lesson, you have been introduced to a number of standards-related terms. Knowing the language of standards, like knowing the language of a foreign country you are traveling to, helps you to understand the territory you have entered and interact with the locals and other fellow travelers. Key fundamental standards terms associated with this module include:

American National Standard (ANS)* -- A document that has achieved consensus in accordance with the *ANSI Procedures for the Development and Coordination of American National Standards* and the procedures of an ANSI Accredited Standards Developer (ASD), and that has been approved by the ANSI Board of Standards Review or by an ANSI Audited Designator.

American National Standards Institute (ANSI)* -- A private, non-profit organization that coordinates the U.S. voluntary standardization and conformity assessment system. Its mission is to enhance U.S. global competitiveness and the American quality of life by promoting, facilitating, and safeguarding the integrity of the voluntary standardization system.

Consensus* -- General agreement that involves seeking and taking into account the view of all parties concerned, and to reconcile any conflicting arguments. Consensus is more than a simple majority, but does not imply unanimity.

De Facto Standard -- A standard that is widely accepted in the market place but which was not developed and adopted through the open consensus-based process used by SDOs.

Government-Unique Standard -- A standard developed specifically for use by the government. These standards are not developed by the open consensus-based process used by SDOs.

Industry Standard* -- A voluntary, industry-developed document that establishes requirements for products, practices, or operations.

International Standard* -- A standard adopted or developed for global use.

*ANSI definitions

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The Language of Standards (cont.)

Interoperability* -- Ability of a system or a product to work with other systems or products without special effort on the part of the customer. Interoperability is made possible by the implementation of standards.

Mandatory Standards* -- Standards incorporated into laws or technical regulations for the protection of public health, safety, and the environment; or when incorporated into contractual agreements, between buyers and sellers.

Open Standards -- Standards that are not proprietary and are available for everyone to use.

Proprietary Standard -- A standard developed by a particular company for its own use and not made available for others to use. These standards are not developed by the open consensus- based process used by SDOs.

Standard* -- A standard is a document that defines the characteristics of a product, process or service, such as dimensions, safety aspects, and performance requirements.

Standards Body* -- An organization that is involved in regulating, developing and promoting standards and/or coordinating the standards development process. Standard bodies can be government-based, private-sector-based or a combination. ANSI is a private-sector standards body.

Standard Developer or Standard Developing Organization (SDO)* – An organization, committee, company, governmental agency or group that develops standards.

Voluntary Standard* -- The term "voluntary" distinguishes the standards development process from governmental or regulatory processes. Voluntary standards are also made mandatory at times by being incorporated into law by governmental bodies.

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Quick Quiz

Now that you know the basics of what standards are and why they are important,
Click Next and take this quick quiz. More than one answer may be selected.

Want to learn more about standards? Visit the following websites:

- American National Standards Institute (ANSI) http://www.ansi.org
- Organization of Standardization (ISO) http://www.iso.org
- InterNational Committee for Information and Technology Standards (INCITS) http://www.incits.org
- National Institute of Standards and Technology (NIST) http://www.nist.gov
- Defense Standardization Program http://www.dsp.dla.mil
- Defence Geospatial Information Working Group (DGIWG) https://www.dgiwg.org/dgiwg/

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Part 1 Quick Quiz

1. Standards are:
   a. Agreements that are developed for products, processes, and services
   b. Specifications that are written into a regulation or law.
   c. Developed by the government or a standards body.
   d. All of the above
   Answer:
   d. All of the above

2. Standards benefit your daily life by:
   a. Enhancing convenience and ensuring your safety and health
   b. Allowing you to communicate over the telephone and internet
   c. Saving you money
   d. All of the above
   Answer:
   d. All of the above

3. Product standardization benefits a business by:
   a. Reducing costs
   b. Increasing potential suppliers
   c. Reducing technology risks
   d. All of the above
   Answer:
   d. All of the above

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Part 1 Quick Quiz (cont.)

4. Accredited standards development organizations:
   a. Create de facto standards
   b. Are non-profit organizations
   c. Follow consensus-based development processes approved by ANSI
   d. None of the Above
   Answer:
   c. Follow consensus-based development processes approved by ANSI

5. Government developed or identified standards are:
   a. Always mandatory
   b. Are only created when private sector standards are not available or feasible to use
   c. May be written into laws and regulations
   d. Always voluntary
   Answer:
   b. Are only created when private sector standards are not available or feasible to use
   c. May be written into laws and regulations

6. Voluntary standards are:
   a. Mandated to be used when there are no other standards available
   b. Developed by a consensus process approved by ANSI
   c. Accepted in the market place by wide spread use
   d. Developed by the government
   Answer:
   b. Developed by a consensus process approved by ANSI

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Part 1 Quick Quiz (cont.)

7. The U.S. system of standards:
   a. Is a government run program
   b. Is an industry consortia that mandates standards
   c. Is mostly an industry led system of standards bodies and developers that includes the federal government
   d. Promotes U.S. industry and business

   Answer:

   c. Is mostly an industry led system of standards bodies and developers that includes the federal government

8. The U.S. Government promotes the use of voluntary standards in order to:
   a. Meet national needs
   b. Decrease costs
   c. Increase government oversight
   d. Promote U.S. Business enterprises

   Answer:

   a. Meet national needs
   b. Decrease costs
   d. Promote U.S. Business enterprises

Congratulations!

You've Completed

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